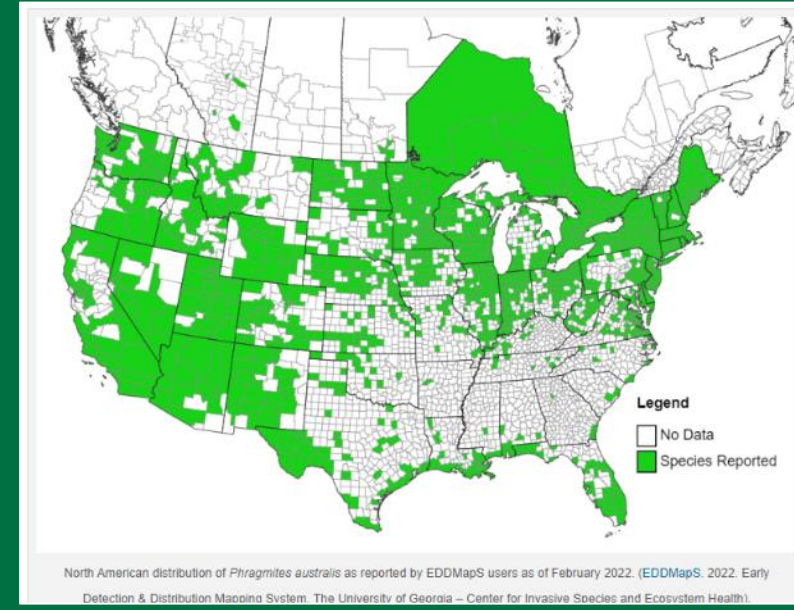


U.S. Geological Survey *Phragmites* Microbial Control Experiment: Grosse Ile Nature and Land Conservancy's Taylor Preserve

April 13th, 2024

Spenser Widin, Meagan Froeba, and Kurt Kowalski
USGS Great Lakes Science Center

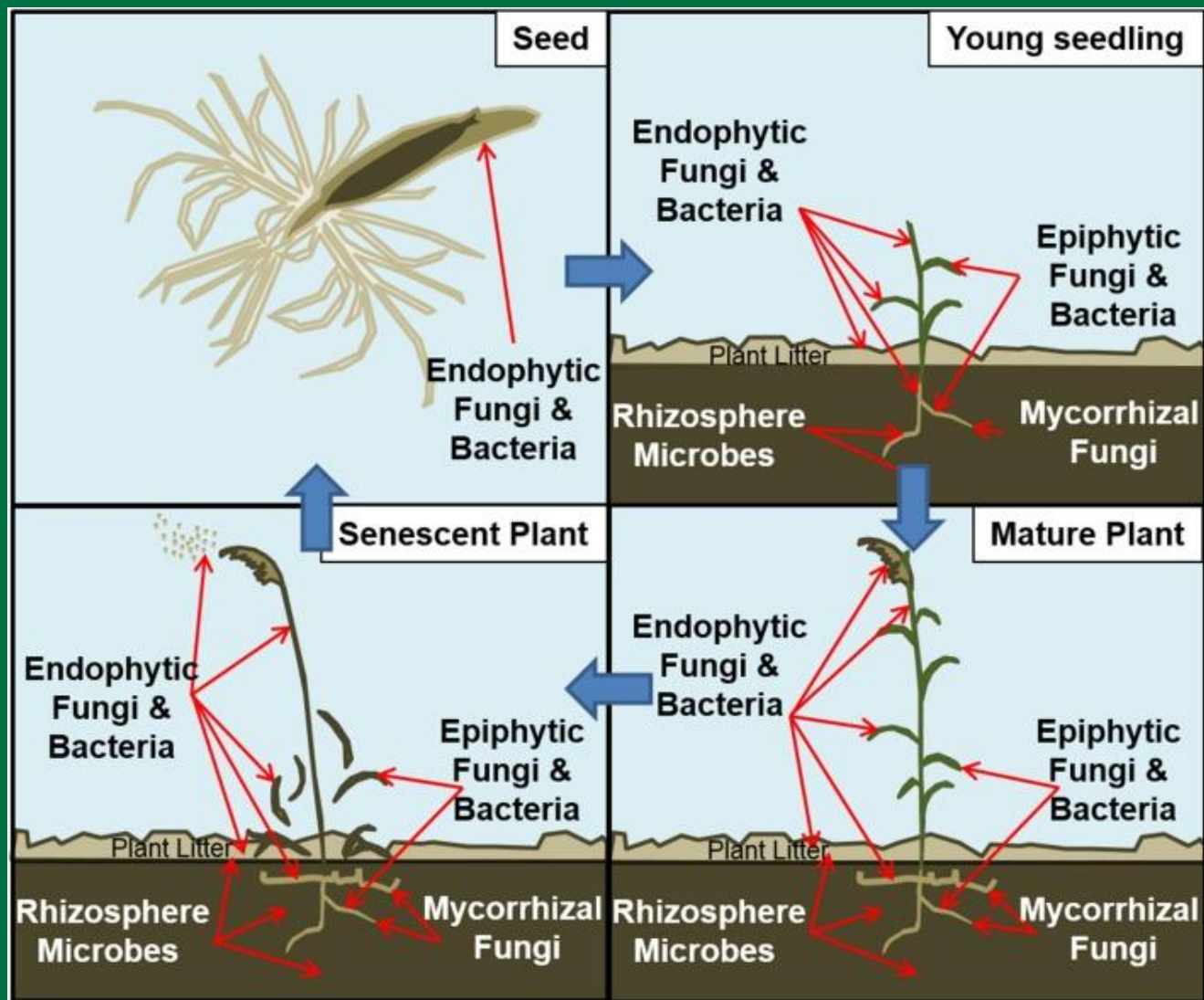
Phragmites australis (common reed)



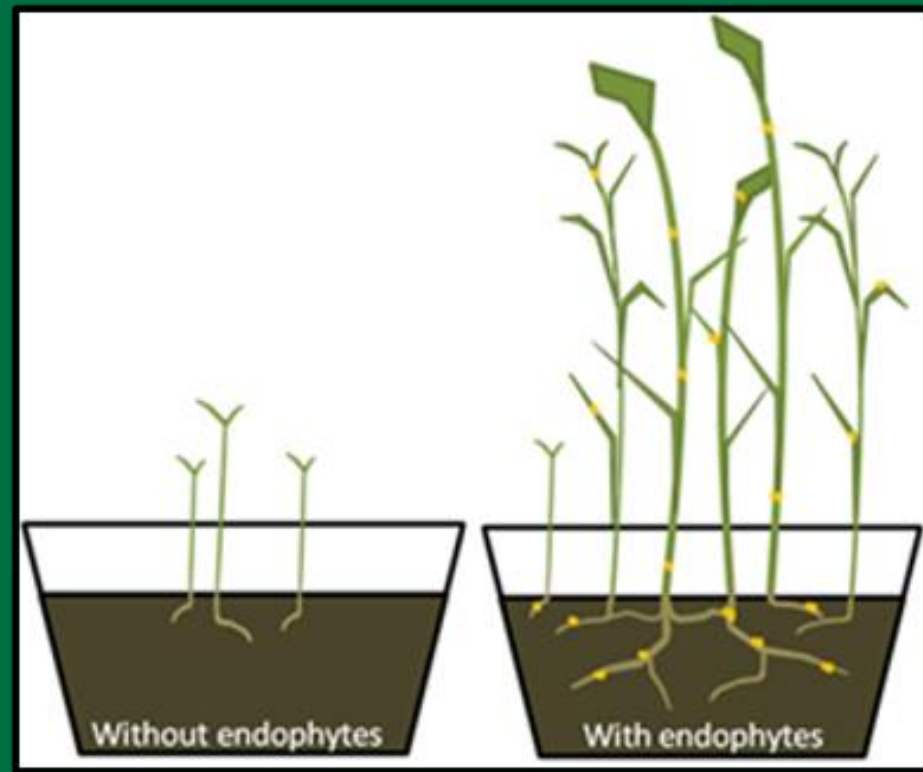
Phragmites Management



The Role of Microbes in *Phragmites* Growth

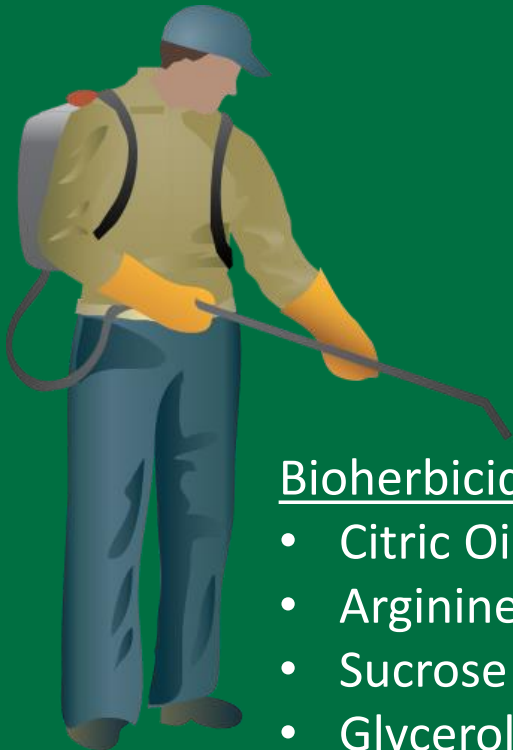


Kowalski et al. 2015



Based on Ernst et al. 2003

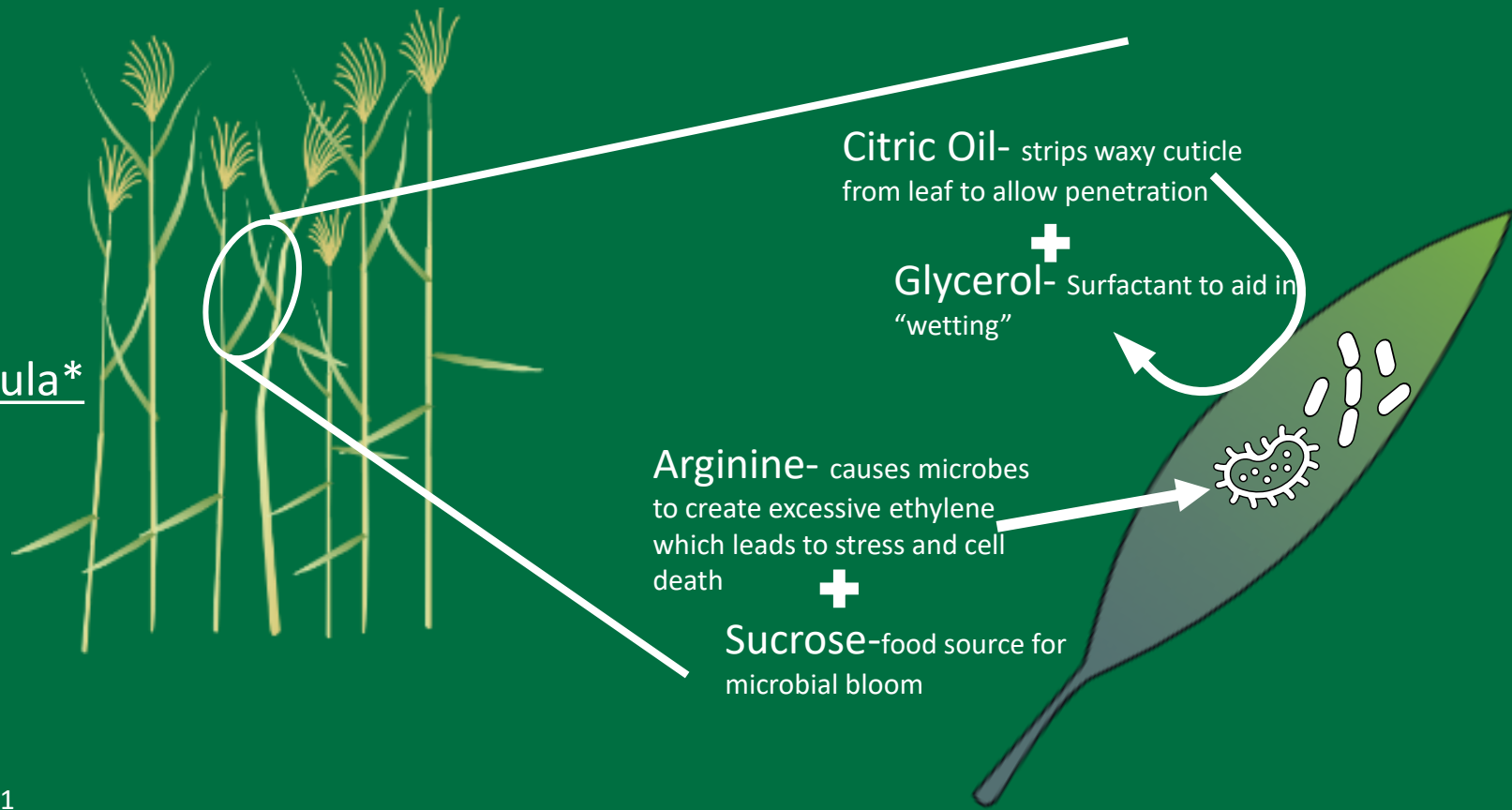
Bioherbicide Development for Targeting Microbial Relationships



Bioherbicide Formula*

- Citric Oil
- Arginine
- Sucrose
- Glycerol
- Yeast
- Water Solvent

*US Patent # 20230067609-A1

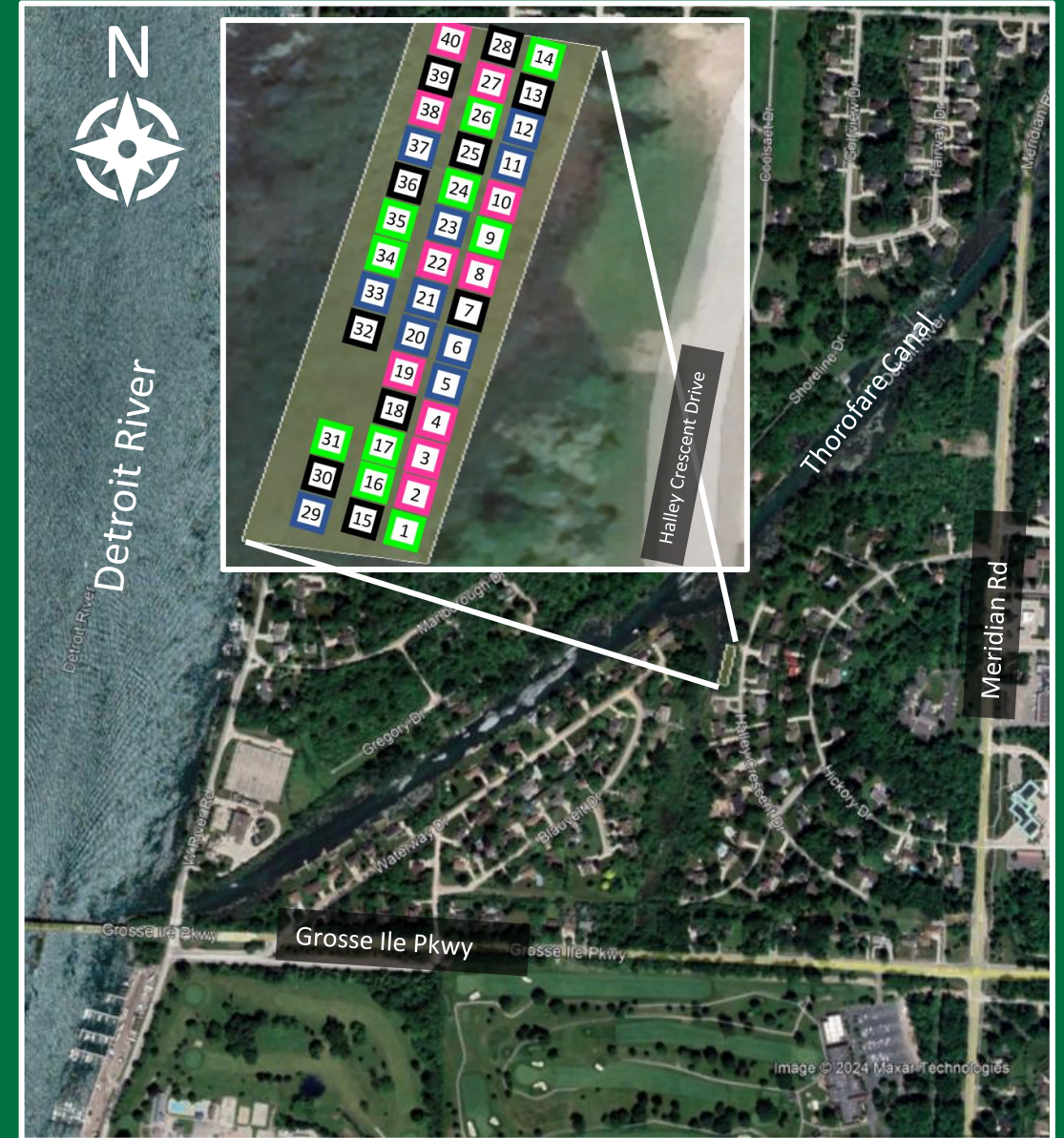


USGS Bioherbicide Experiment Initiation

- Site: GILNC Taylor Preserve, Halley Crescent Drive
- 40-1m x 1m Plots
 - **“Control”** - Water only
 - **“Early”** - Bioherbicide every 4-weeks starting in June
 - **“Cut + Treat”** - Cut in June then bioherbicide every 4-week
 - **“Late”** – Bioherbicide every 4-weeks starting in August

Treatment Dates

Jun 9 Jul 14 Aug 10 Sept 8



USGS Bioherbicide Experiment Initiation

Clear standing dead stems



Photo credit: USGS

Establish Series of 1m x 1m Experimental Plots



Photo credit: USGS

Sever belowground connections to existing stand



Photo credit: USGS

Apply Bioherbicide Product



Photo credit: USGS

Monitor Plant Response



Photo credit: USGS

Sequence of Events



Bioherbicide Treatment Effects: Within 1 week



Photo credit: USGS

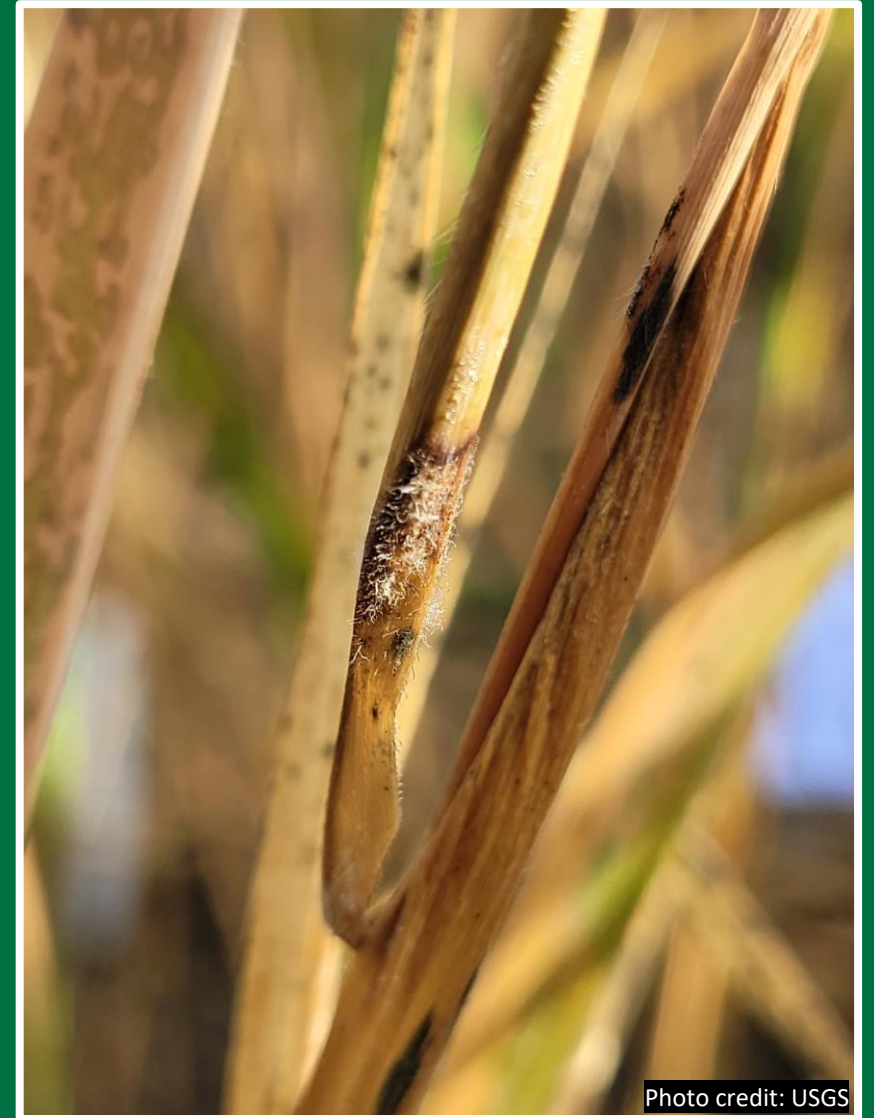


Photo credit: USGS

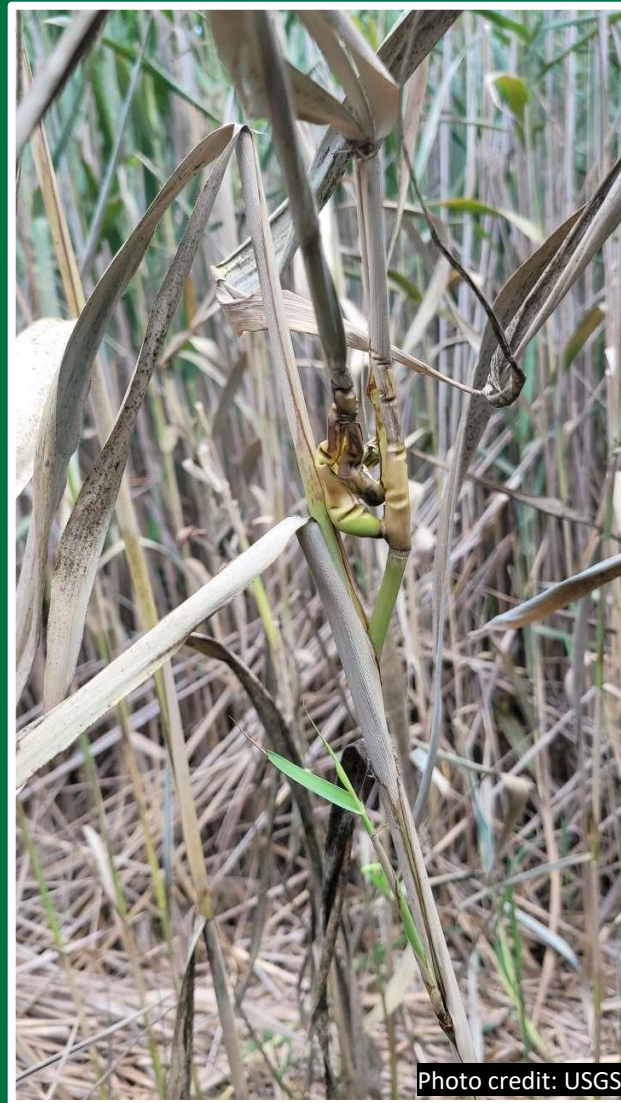


Photo credit: USGS

Bioherbicide Treatment Effects: Within 2 weeks



Bioherbicide Treatment Effects: Within 3-4 weeks



Pre-Treatment June 9th, 2023

Control



Early Application



Cut + Early Apply



* Late Application

* Not Pictured, due to no treatment applied until August 10th

Post 1st Treatment- June 23rd, 2023

Control



Early Application



Cut + Early Apply



* Late Application

*Not Pictured, due to no treatment applied until August 10th

Post 2nd Treatment- July 20th, 2023

Control



Early Application



Cut + Early Apply



* Late Application



* After 1st late season treatment

Post 3rd Treatment- August 25th, 2023

Control



Early Application



Cut + Early Apply



* Late Application



*After 1st late season treatment

Post 4th and Final Treatment- September 22nd, 2023

Control



Early Application



Cut + Early Apply



* Late Application



*After 2nd late season treatment

Belowground Resource Reserves

Carbohydrate Content of Rhizomes

- **Sugars** – Immediate Energy Needs of Plant
 - Control = Early = Cut = Late
- **Starch** – Longer Term Energy Storage
 - Control > All Treatments by ~50%
 - No Difference between Treatments
 - Cut = Early = Late



Conclusions

- Clear signs of treatment impacts
- Contact effect vs. systemic effect
 - Effective at killing aboveground tissues
 - Rhizomes remain viable with less reserves
- Potential for compounding effects after multiple seasons of treatment
- Continue to refine formula and methods



Thank You!



USGS Staff and Contractors

- Sasha Bozimowski
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